PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference P35750P0-497	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/JP2004/016507	International filing date *(day/month/year)* 01 November 2004 (01.11.2004)	Priority date *(day/month/year)* 04 November 2003 (04.11.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO.,LTD.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 10 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 08 May 2006 (08.05.2006)
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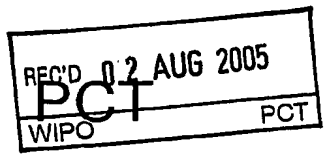
Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY



To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* see form PCT/ISA/210 (second sheet)	
Applicant's or agent's file reference see form PCT/ISA/220	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/JP2004/016507	01.11.2004	04.11.2003

International Patent Classification (IPC) or both national classification and IPC
H01L33/00, H01L27/15

Applicant
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Krause, J Telephone No. +49 89 2399-2829

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-28
	No:	Claims	
Inventive step (IS)	Yes:	Claims	25-28
	No:	Claims	1-24
Industrial applicability (IA)	Yes:	Claims	1-28
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Concerning Section V:

I. Claims 1 to 10:

1. The document EP-A-0 411 612, which will be referred to as D1 in the following procedure, describes a semiconductor light emitting device comprising (cf. column 3, line 12, to column 7, line 48, and Figs 1, 2, and 5 to 8) a multilayer epitaxial structure (1-3, 5) including a first conductive layer (1-3), a second conductive layer (5), and a light emitting layer between the first conductive layer (1-3) and the second conductive layer (5), a main surface of the second conductive layer (5) which faces away from the light emitting layer being a light extraction surface, a first electrode (8) formed on a main surface of the first conductive layer (1-3) which faces away from the light emitting layer, a second electrode (6) formed on a main surface of the second conductive layer (5) which faces away from the light emitting layer, a first power supply terminal that is electrically connected to the first electrode (8), and a second power supply terminal (11) that is electrically connected to the second electrode by means of a conductive member which extends from the second electrode in a direction parallel to the main surface of the second conductive layer.

2. The subject-matter of claim 1 differs therefrom only in that the first power supply terminal forms at least part of a metal layer, on which the multilayer epitaxial structure is formed such that the first conductive layer is closer to the metal layer than the second conductive layer, in that the metal layer supports the multilayer epitaxial structure, and in that the metal layer conducts heat generated in the light emitting layer.

3. The person skilled in the art would routinely surface mount the light emitting device according to document D1 to a metal layer on a circuit board when appropriate, and this metal layer would be the power supply terminal meeting all the specifications of claim 1. The skilled person would thus obtain a device with all the features of claim 1 without employment of inventive skill. Claim 1 is therefore not considered to meet the requirement of Article 33(3) PCT.

4. The additional feature of dependent claim 2 is known from the document US-B-6 599

768, which will be referred to as D2 in the following procedure and which belongs to the same narrow technical field of semiconductor light element production (cf. column 4, line 40, to column 7, line 28, and Figs 3 and 4). Claim 2 is therefore not considered to meet the requirement of Article 33(3) PCT.

5. The additional features of dependent claims 3 to 5 are routine variations of the arrangement according to claim 2, which would be chosen by a person skilled in the art according to circumstances. Claims 3 to 5 are therefore also not considered to meet the requirement of Article 33(3) PCT.

6. The additional features of dependent claims 6 to 10 are known eg from the document US-B-6 495 862, which will be referred to as D3 in the following procedure (cf. column 4, line 1, to column 5, line 14, column 10, line 11, to column 11, line 21, column 13, lines 28 to 60, and Figs 1, 9, and 13) and which also belongs to the same narrow technical field as documents D1 and D2. Claims 6 to 10 are therefore not considered to meet the requirement of Article 33(3) PCT either.

II. Claims 11 to 18:

1. The document D2 describes a semiconductor light emitting device comprising:
an array of semiconductor light emitting elements formed in such a manner that a plurality of light emitting elements are connected in series (in document D2 prior to the separation step), wherein each of the plurality of light emitting elements includes the features of the light emitting elements of document D1: a multilayer epitaxial structure (1-3, 5) including a first conductive layer (1-3), a second conductive layer (5), and a light emitting layer between the first conductive layer (1-3) and the second conductive layer (5), a main surface of the second conductive layer (5) which faces away from the light emitting layer being a light extraction surface, a first electrode (8) formed on a main surface of the first conductive layer (1-3) which faces away from the light emitting layer, and a second electrode (6) formed on the main surface of the second conductive layer (5) which faces away from the light emitting layer, the first electrode and the second electrode being positioned to each other in a same manner for each light emitting element;

a metal layer (100, cf. document D2) on which the light emitting element array is formed, with an insulating layer (105) therebetween, in such a manner that the first electrode is positioned closer to the metal layer than the second electrode is, the metal layer connecting and supporting the multilayer epitaxial structures and conducting heat generated in the light emitting layer, wherein the metal layer is electrically divided into at least two portions, at least one of the portions is connected to a first electrode of a light emitting element at one end of the light emitting element array, to be constituted as a first power supply terminal, and at least one of a rest of the portions is connected to a second electrode of a light emitting element at the other end of the light emitting element array, by means of a conductive member which extends from the second electrode in a direction parallel to a main surface of a second conductive layer of the light emitting element, to be constituted as a second power supply terminal.

2. As a consequence, the person skilled in the art would obtain all the features of claim 11 from a routine combination of the teachings of documents D1 and D2. Claim 11 is therefore not considered to meet the requirement of Article 33(3) PCT.

3. The additional features of dependent claims 12 to 16 relate to the specific embodiment of the light emitting elements used and are generally known, eg from document D3. The person skilled in the art would apply these additional features when appropriate and obtain a device with all the features of claims 12 to 16 without employment of inventive skill. Claims 12 to 16 are therefore not considered to meet the requirement of Article 33(3) PCT either.

4. The additional features of claims 17 and 18 fall into the competence of an average practitioner. Claims 17 and 18 are therefore not considered to meet the requirement of Article 33(3) PCT.

III. Claims 19 to 24:

1. The document DE-A-100 26 254, which will be referred to as D4 in the following procedure, describes (cf. paragraphs [0027] to [0040] and Figs 1 and 2) a manufacturing method of a semiconductor light emitting device, comprising the steps of forming a

multilayer epitaxial structure (3) by epitaxial growth on one of the main surfaces of a single-crystal substrate (2), the multilayer epitaxial structure including a first conductive layer (5), a second conductive layer (4), and a light emitting layer (19) between the first conductive layer and the second conductive layer, the second conductive layer being positioned closer to the main surface than the first conductive layer is, forming a first electrode (6) on the main surface of the first conductive layer which faces away from the light emitting layer (19), bonding the multilayer epitaxial structure to a metal layer (11), which is divided electrically into at least two portions (22, 23), so as to be closer to the first electrode (6) than to the second conductive layer (4), the metal layer (11) supporting the multilayer epitaxial structure (3), separating the single-crystal substrate (2) from the multilayer epitaxial structure (3), forming a second electrode (7) on a main surface of the second conductive layer (4) which faces away from the light emitting layer.

2. The subject-matter of claim 19 differs therefrom only in that the metal layer (11) is formed on the multilayer epitaxial structure and electrically dividing said metal layer instead of bonding the multilayer epitaxial structure to the metal layer already electrically divided. This difference is, however, a technical alternative the person skilled in the art would employ according to circumstances without any inventive activity. Claim 19 is therefore not considered to meet the requirement of Article 33(3) PCT.

3. The additional features of dependent claims 20 and 21 fall into the competence of an average practitioner. Claims 20 and 21 do therefore not appear to meet the requirement of Article 33(3) PCT.

4. The additional feature of claim 22 is known eg from document D3 and would be readily applied by a skilled person when desired. Claim 22 is thus not considered to meet the requirement of Article 33(3) PCT.

5. The additional features of claims 23 and 24 are generally known methods of separating the growth substrate, wherein the method step of claim 24 is used in document D4 as well. Therefore claims 23 and 24 are not considered to meet the requirement of Article 33(3) PCT either.

IV. Claims 25 to 28:

1. The method according to claim 25 comprises the steps of forming a metal layer on the separated semiconductor light emitting elements, whereby an insulating layer and an electrode have been formed on the light emitting elements. The document D2 differs therefrom in that the finished light emitting elements are separately bonded to the metal layer and in that the insulating layer between the electrode and the metal layer is not provided. The document D4 describes also a bonding of light emitting device chips to a metal layer, but not the forming of an array. Neither do documents D1 and D3 describe the formation of an array.

2. As a consequence, the person skilled in the art would not obtain a method with all the features of claim 25 by a routine combination of any of documents D1 to D4. He would need inventive activity to replace the bonding of separated dies to the metal layer by forming a metal layer on an assembly of dies. Therefore claim 25 is considered to meet the requirements of Article 33(2) and (3) PCT.

3. Claims 26 to 28 depend on claim 25, ie they comprise all the features of claim 25. Since claim 25 appears to meet the requirements of Article 33(2) and (3) PCT, also claims 26 to 28 are considered to meet these requirements.

Concerning Section VII:

1. Independent claims 1, 11, 19, and 25 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (documents D1 or D4, respectively) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

2. The features of the claim/s are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D4 is not mentioned in the description, nor are these documents identified therein.

Concerning Section VIII:

1. In claim 25 the meaning of the expression "dividing the multilayer epitaxial structure in a plurality of portions" is not clear in the sense of Article 6 PCT. Since a metal layer is formed on the portions after the division, it appears that the chips should not be completely separated. The extend of the separation is not specified in claim 25.